REMARKS

Claims 1-5 and 7-11 are pending. No amendments have been made to the claims.

Rejections under 35 U.S.C. 103(a)

1. Claims 1, 4-5, and 7-11 stand rejected under 35 U.S.C § 103(a) as being unpatentable over Fronsman et al. (Fronsman) US 3,825,484 in view of Japanese patent 51-119632 and Naumov et al. (Naumov) US 4,604,175. Applicants respectfully disagree.

As noted in Applicant's previous Response to the non-Final Office Action mailed April 05, 2007, the Supreme Court in *Graham v. John Deere*, 383 U.S. 1, 17, 86 S.Ct. 684, 694 (1966) set out the factual inquiry which the various district courts and the Patent Office must follow in determining obviousness. According to the Supreme Court, an obviousness analysis requires a determination of the: (1) scope and content of the prior art; (2) differences between the prior art and the Claims at issue; (3) level of ordinary skill in the pertinent art.

Scope and Content of the Prior Art

Fronsman discloses an apparatus comprised of: an unsealed casing; a plurality of rotating cathodes; a plurality of stationary anodes; a means for removing copper from the cathodes; and a means for collecting the copper in a bin. See Fronsman at Figures 1, 2, and 6; column 1 lines 60-72; column 5 lines 1-47; column 4 lines 18-19, 43-46; and column 5 lines 21-44.

The Japanese patent document 51-119632 discloses a method for treating copper etching solution in an unsealed electrolytic cell containing a cathode and a plurality of anodes. Cuprous chloride is oxidized to cupric chloride at the anodes and metal copper is generated at the cathode. The cathode is separated from the anodes by a diaphragm, described as the cathode chamber. Copper accumulates at the bottom of the cathode chamber where a potential is applied to prevent dissolution of the copper. Abstract and Figures 1 and 2.

Naumov discloses a process for regenerating an iron-copper chloride etching solution that uses a diaphragm electrolyzer. column 2 lines 53-56. In the diaphragm electrolyzer, etching solution is passed into the cathodic space and then into the anodic space. column 3 lines 1-3. Chlorine gas, generated at the anode, is "partly absorbed in the electrolyzer because the the gas oxidizes Fe(II) to Fe(III). column 3 lines 5-10. It is important to note that the unreacted chlorine gas is redirected back into the anodic chamber at a rate 1.5 times faster than the stream entering

the cathodic compartment. This difference in flow rate optimizes the use of chlorine gas as an oxidant. column 3 lines 15-19. In order to achieve different flow rates and optimization of chlorine gas as an oxidant, a diaphragm is necessary. column 3 lines 19-22. Finally, Naumov teaches the recycling of chlorine gas. Unreacted chlorine gas is passed into a "vessel with the etching solution, wherein it is fully absorbed...." column 3 lines 12-14.

Differences Between the Prior Art and the Claims at Issue

Claims 1 and 7 are directed to a method and an apparatus, respectively, for regenerating etching solutions containing iron. Claims 1 and 7 require a sealed electrolysis cell such that gas is prevented from escaping from the etching solution. Further, Claims 1 and 7 require the etching solution to contact the cathode first, then contact the anode, and then exit the cell. Finally, there is no diaphragm separating the cathode and anode.

As noted by the Office, the Fronsman apparatus is not sealed in the manner required by the instant claims. Action page 2. Further, Fronsman shows that the cathodes and anodes are positioned within the cell in such a manner that the etching solution contacts the cathodes and anodes at the same time until flowing out of the cell. See Figure 1 of Fronsman. The claimed invention requires the etching solution to contact the cathode first and then the anode before exiting the cell.

The Japanese patent discloses a method for oxidizing cuprous chloride in an etching solution to cupric chloride, not Fe(II) to Fe(III). The method, as described in Figures 1 and 2, uses an unsealed cell that contains a cathode and a plurality of anodes. The anodes are separated from the cathode by a diaphragm and the flow pattern allows the etching solution to contact the cathode and anode at the same time. The instant invention requires oxidation of Fe(II) to Fe(III), a sealed gas-tight apparatus, a specific flow pattern, and no diaphragm.

Naumov discloses an electrolytic cell that contains a diaphragm. column 3 lines 21-22. The diaphragm separates the anode and cathode and allows separate and different flow rates into the cathodic and anodic compartments. column 3 lines 15-19. The different flow rates are necessary to increase the efficiency of the electrolytic cell. Naumov also teaches the recycling of chlorine gas. column 3 lines 25-28. The claimed invention does not contain a diaphragm, does not recycle chlorine gas, and does not have two different streams with different flow rates. The

flow rate of the instant invention is channeled to the cathode, then to the anode at the same flow rate, and then the solution exits the cell.

In summary, the combination of Naumov, JP 51-119632, and Fronsman do not teach the flow pattern of the claimed invention. The claimed invention requires one stream with a flow pattern that enters the cell, contacts the cathode first, then contacts the anode, and finally, exits the cell without the use of a diaphragm nor the use of two different streams at different flow rates.

Level of Ordinary Skill in the Pertinent Art

The Office asserts that:

> "the claims as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the disclosure of the Fronsman patent with the teaching of the Naumov patent, because the Naumov patent teaches the reabsorbing of the chlorine gas formed into the solution as claimed." Action page 2.

Applicants respectfully submit that reabsorption of chlorine gas is not an element of the instant claims. Moreover, the specification suggests the use of chlorine free etching solutions. Page 4 lines 19-20. Chlorine is corrosive and environmentally undesirable. Page 2 lines 18-19 and Page 4 lines 18-19. Naumov also teaches the use of two streams, one contacts the cathode and the other contacts the anode. This arrangement allows chlorine to be recycled into the anodic stream and also allows for two different flow rates. In particular, Naumov teaches that the anodic stream is "at least 1.5 times higher" than the stream contacting the cathode. Column 3 lines 15-19. One skilled in the art would not reasonably predict the apparatus or method encompassed by the instant claims based on the disclosures in Fronsman and Naumov. The claimed invention is directed to an electrolytic cell with a flow pattern that contacts the cathode first, then the anode at the same flow rate, and then exits the cell. There is only one stream and the flow rate to the cathode and then the anode is the same or nearly identical. This flow pattern is essential to the invention. Page 8 lines 31-34. This flow prevents "back-mixing" or, in other words, prevents Fe (III) that was oxidized at the anode from being reduced back at the cathode to Fe(II), thereby improving efficiency. Page 8 lines 31-36 and Page 9 lines 5-6.

One skilled in the art, based on Naumov, Fronsman, and the Japanese references, would not have envisioned and could not have predicted the apparatus (or method) of the instant claims.

Naumov, Fronsman, and the Japanese reference describe electrolytic cells where the flow pattern allows the etching solution to make contact with the cathodes and anodes simultaneously or at different flow rates. There is neither a suggestion nor a teaching within the cited documents, explicit or implicit, to combine the following elements required by claim 1: a sealed electrolytic cell that prevents gas from escaping; a flow pattern where the etching solution contacts a cathode first followed by an anode and then exits the system; means for removing copper metal from the cathode; means for collecting the copper metal; applied potential across the copper metal; and the absence of an ion exchange membrane or diaphragm. There is nothing in the prior art that suggests an etching system that requires all of these features. Applicants therefore respectfully submit that the Office has not made out a *prima facie* case of obviousness. The differences discussed above would not have been obvious to one skilled in the art at the time the invention was made. The Supreme Court, quoting *In re Kahn*, stated that "rejections [based] on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR v. Teleflex Inc.* 127 S. Ct. 1727, 1741 (2007). The required "rational underpinning" is absent here.

2. Claims 2 and 3 stand rejected under 35 U.S.C § 103(a) as being unpatentable over Fronsman in view of the Japanese patent, Harms et al. (Harms) US 3,933,606, and Naumov. The claimed method varies the flow of electrolyte and/or the current in the electrolysis cell by measuring the concentration of Fe(II)/Fe(III) or copper. Harms discloses a method of purifying water in which voltage is varied across a plurality of plates based on the conductivity of the water.

Applicants respectfully submit that the combination of Fronsman, JP 51-119632, Harms, and Naumov does not disclose all the elements of claims 2 and 3. In particular, the combined references do not disclose a method for regenerating etching solutions containing iron comprising an electrolyte flow pattern that contacts a cathode first and an anode second in a sealed or closed system that adjusts electrolyte flow and/or current across the cell by measuring concentrations of Fe(II)/Fe(III) or copper.

In view of the above amendments and remarks, Applicants respectfully submit that the pending claims are allowable. Reconsideration of this application is respectfully requested and a favorable determination is earnestly solicited.

Respectfully submitted,

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